User Manual

18K/30K Online UPS System

Uninterruptible Power Supply System

Please comply with all warnings and operating instructions in this manual strictly. Save this manual properly and read carefully the following instructions before installing the unit. Do not operate this unit before reading through all safety information and operating instructions carefully.

Table of Contents

1. INTRODUCTION 3

1.1. PRODUCT OUTLOOK 3
1.2. PRODUCT MAJOR FEATURE 5
1.3. PRODUCT OVERVIEW 5

2. INSTALLATION 8

2-1. SAFETY INSTRUCTION 8
2-2. INSTALLATION 8

3. OPERATIONS 10

3-1. PARALLEL SYSTEM OPERATION 10
3-2. REPLACEMENT 11
3-3. DUAL MAINS INPUT (OPTIONAL) & MAINTENANCE BYPASS SWITCH OPERATION 12

4. SINGLE UPS BUTTON AND LCD OPERATION 13

4-1. BUTTON OPERATION 13
4-2. LED INDICATORS AND LCD PANEL 13
4-3. AUDIBLE ALARM 15
4-4. FAULT CODE 16
4-5. WARNING INDICATOR 16

5. TROUBLE SHOOTING 17

6. BATTERY MAINTENANCE 19

6-1. BATTERY MAINTENANCE & STORAGE 19
6-2. IMPORTANT SAFETY CAUTION 19

6. SPECIFICATIONS 20

1. Introduction

This modular redundant UPS system is entirely self-contained to allow each UPS module to work with complete functionality. Its modular design allows easy to service and upgrade with low cost MTTR. It also can be parallel operated with N+1 redundancy for power safety and reliability. This UPS system contains 3 sets of rack-independent online UPS modules, battery packs, and input/output transformer boxes. It's perfect power protection for server room, data center, telecom applications and mission-critical loads.

1.1. Product Outlook

Figure 1: Front view with door closed

Figure 2: Front view with door opened

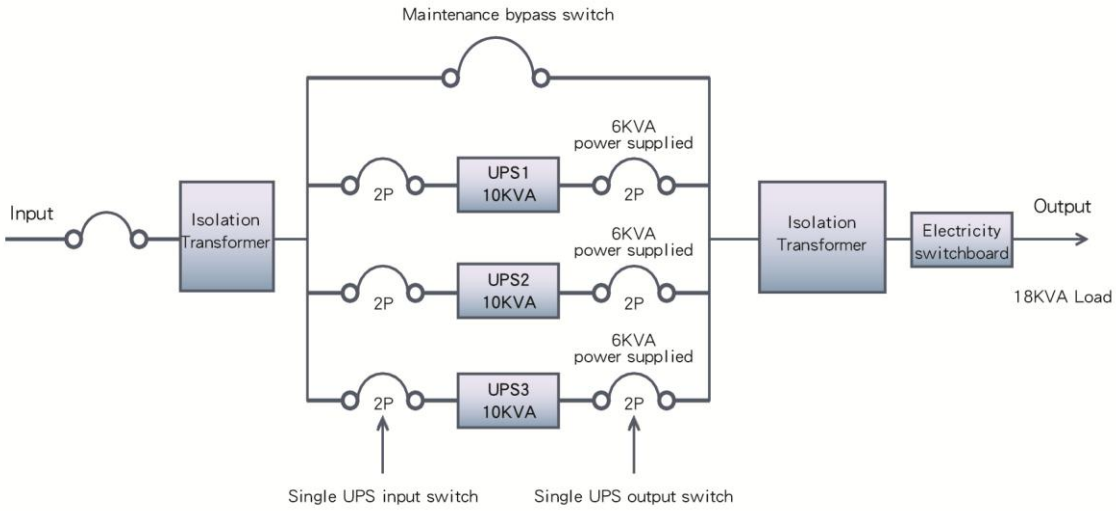
Figure 3: Back view

1.2. Product Major Feature

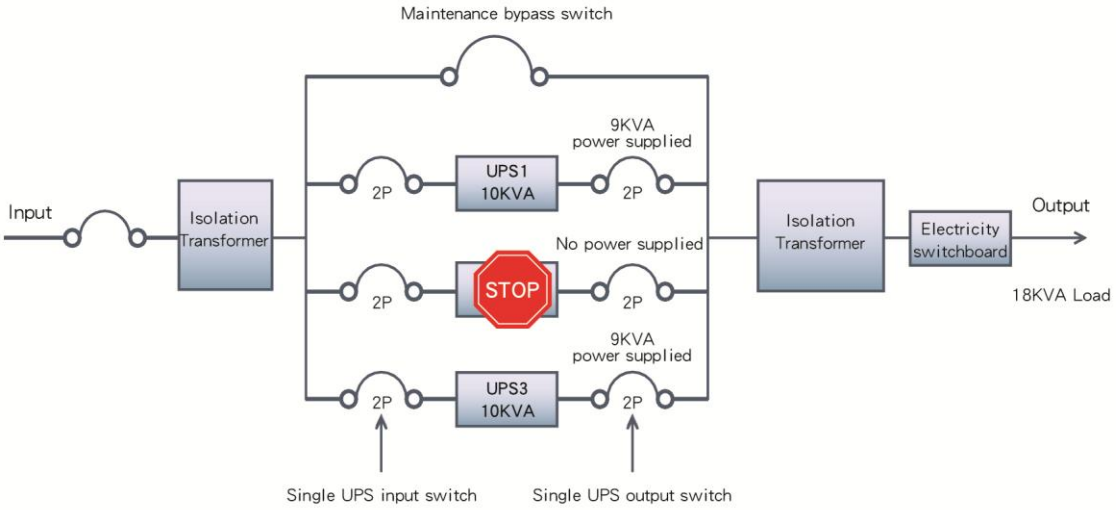
N+1 parallel redundancy for power safety and reliability

N+1 technology allows a flexible adjustment of UPS power capacity all the time. Should any one UPS is malfunctioning, slave UPS will back up the load immediately. It increases power safety and reliability.

Three UPS units supply power to 18KVA loads.



When UPS 2 is not working, other UPSs will automatically supply power to the loads.



1.3. Product Overview

This whole UPS system already includes parallel distribution panels, UPS input/output, manually maintenance bypass switch, and isolation transformer. This chassis is specially designed for UPS system to withstand up to 800kgs.

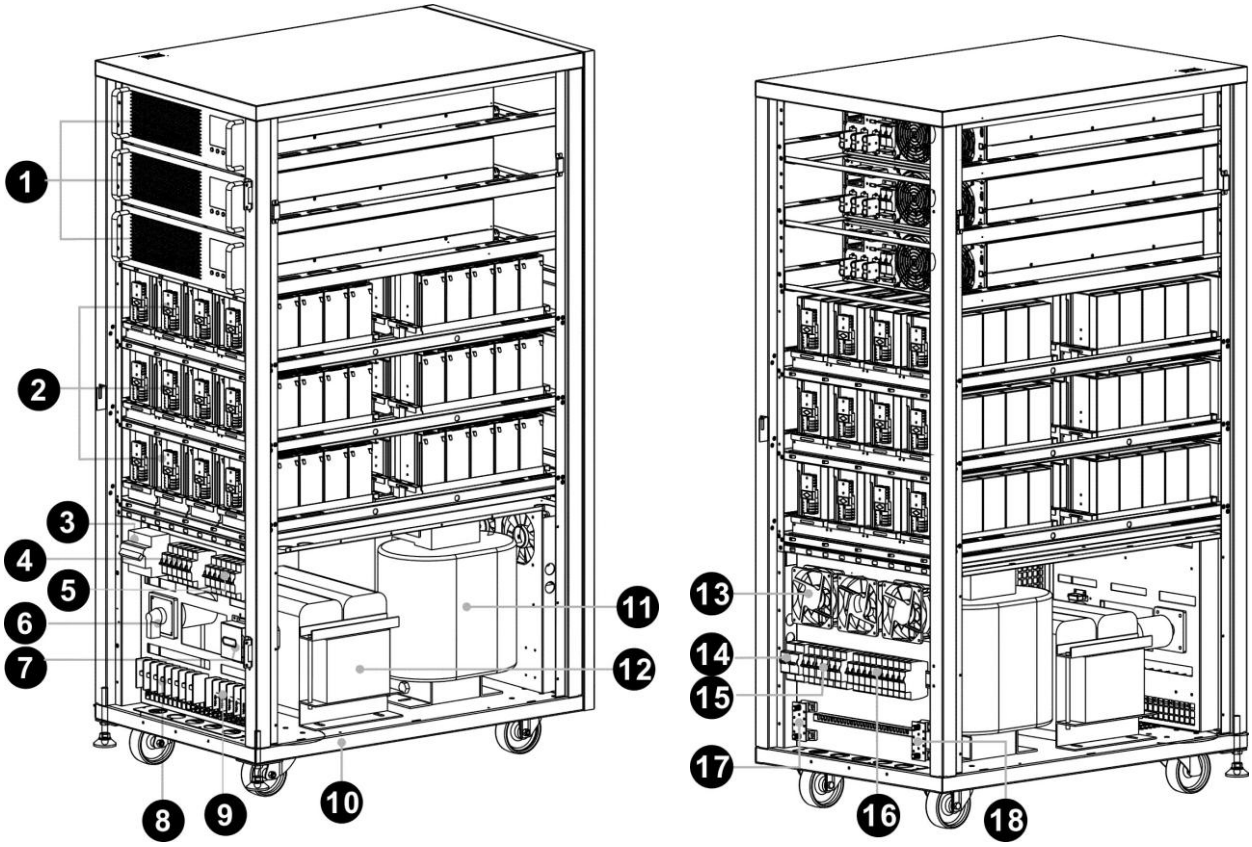


Figure 4: Inside view

1. Single-phase UPS units
2. Battery packs (hot-swappable & dummyproof design)
3. Input master switch
4. Three input breakers for UPS system
5. Three output breakers for UPS system
6. Input switch for the utility
7. Maintenance bypass switch
8. Input distribution panel
   Input: 3-phase 3-wire 220V/220V, 3-phase 4-wire 380V/220V, single phase 220V, or 3-phase 4-wire 208V/120V
9. Output distribution panel
   Output: Single phase 3-wire 220V/110V
10. UPS chassis (withstand up to 800KG)
11. Input isolation transformer
12. Output isolation transformer
13. Cooling fan
14. PDU output master switch
15. PDU output distribution panel (220V, 20A)
16. PDU output distribution panel (110V, 16A)
17. Neutral terminal
18. Grounding terminal

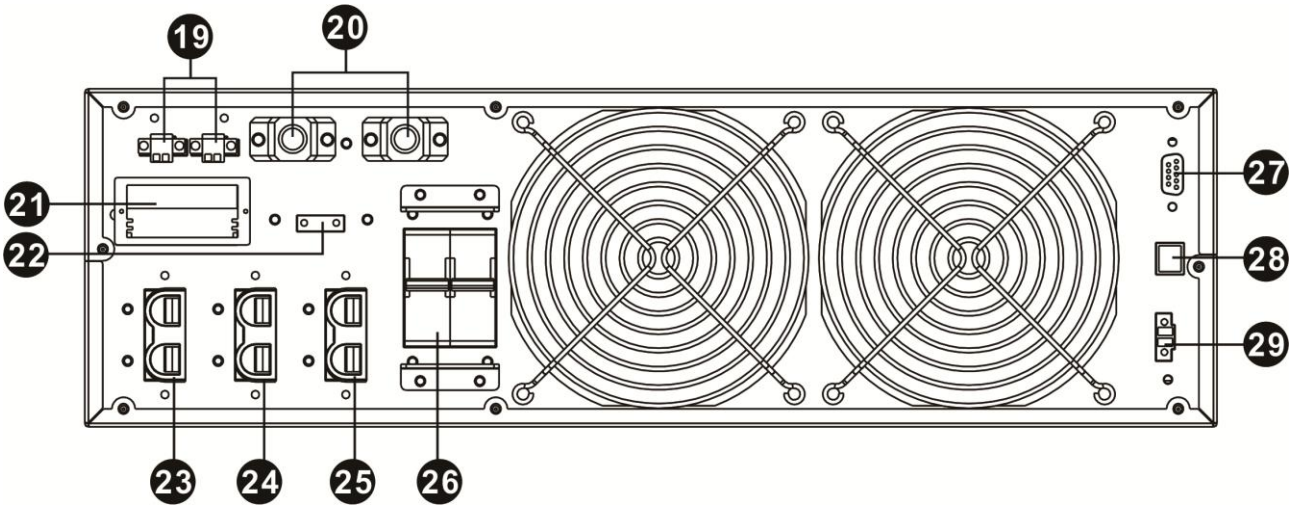


Figure 5: Single UPS back view

19. Share current port
20. Parallel port
21. Intelligent slot
22. External maintenance bypass switch port (EMBS port)
23. UPS output connector (Dummyproof design)
24. Battery connector (Dummyproof design)
25. UPS input connector (Dummyproof design)
26. Input switch
27. RS-232 communication port
28. USB communication port
29. Emergency power off function connector (EPO connector)

CAUTION: Output connector is grey color, battery connector is red color, and input connector is blue color.

Battery is applied with hot-swappable modular design to facilitate battery replacement easily.

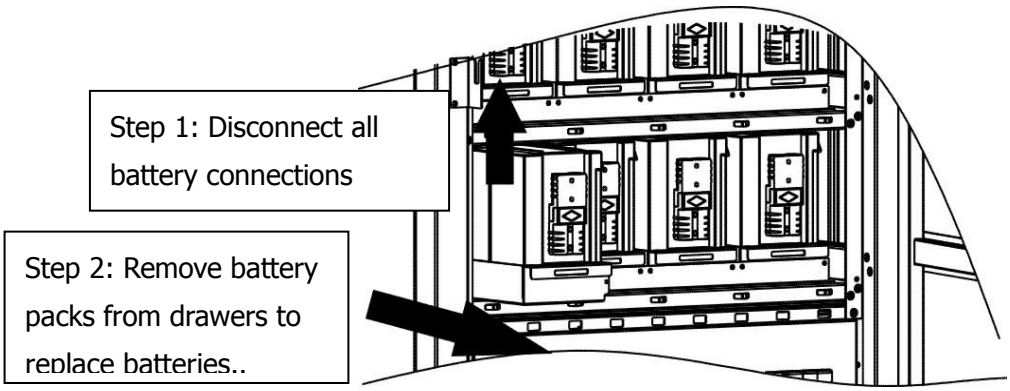


Figure 6: Hot-swappable battery design

2. Installation

2-1. Safety Instruction

1) The UPS must be installed in the room where it is ventilated and dry. Do not install the UPS system near water, flammable liquid, or corrosive substance.
2) Do not block ventilation holes in the UPS chassis. The UPS must be installed in a location with good ventilation. Ensure enough space (at least 0.5m) on each side for ventilation.
3) Condensation may occur if the UPS system is unpacked under cold environment. The UPS system must be absolutely dry before being installed. Otherwise, it may cause electric shocks. Please wait until the inside and outside of UPS system is absolutely dry.

2-2. Installation

Installation and wiring must be performed in accordance with the local electric laws/regulations and execute the following instructions by professional personnel. For safety consideration, please cut off the input utility power before installation. If connecting external batteries, please be sure to cut off battery connection first before installation.

1) Remove the back panel of UPS input/output distribution box.
2) Please use proper wires according to local electric laws/regulation and future expansion plan.

CAUTION: It's strongly recommended that the circuit is exclusively for UPS input, not shared with others. The input switch should withstand at least the maximum input current of the UPS.

3) Connect input and output wires on input and output terminals.

CAUTION: Be sure to connect all wires firmly.

4) Please connect two yellow/green wires. One wire is connected to grounding terminal on the UPS input distribution panel and the other wire is connected to grounding terminal of the loads.
5) Connect all input/output (dotted lines), battery (dotted line), parallel port (grey lines), EPO port (black lines), EMBS port (light grey lines), and share current port (black lines) on the back panel of each UPS unit. Refer to below figure.

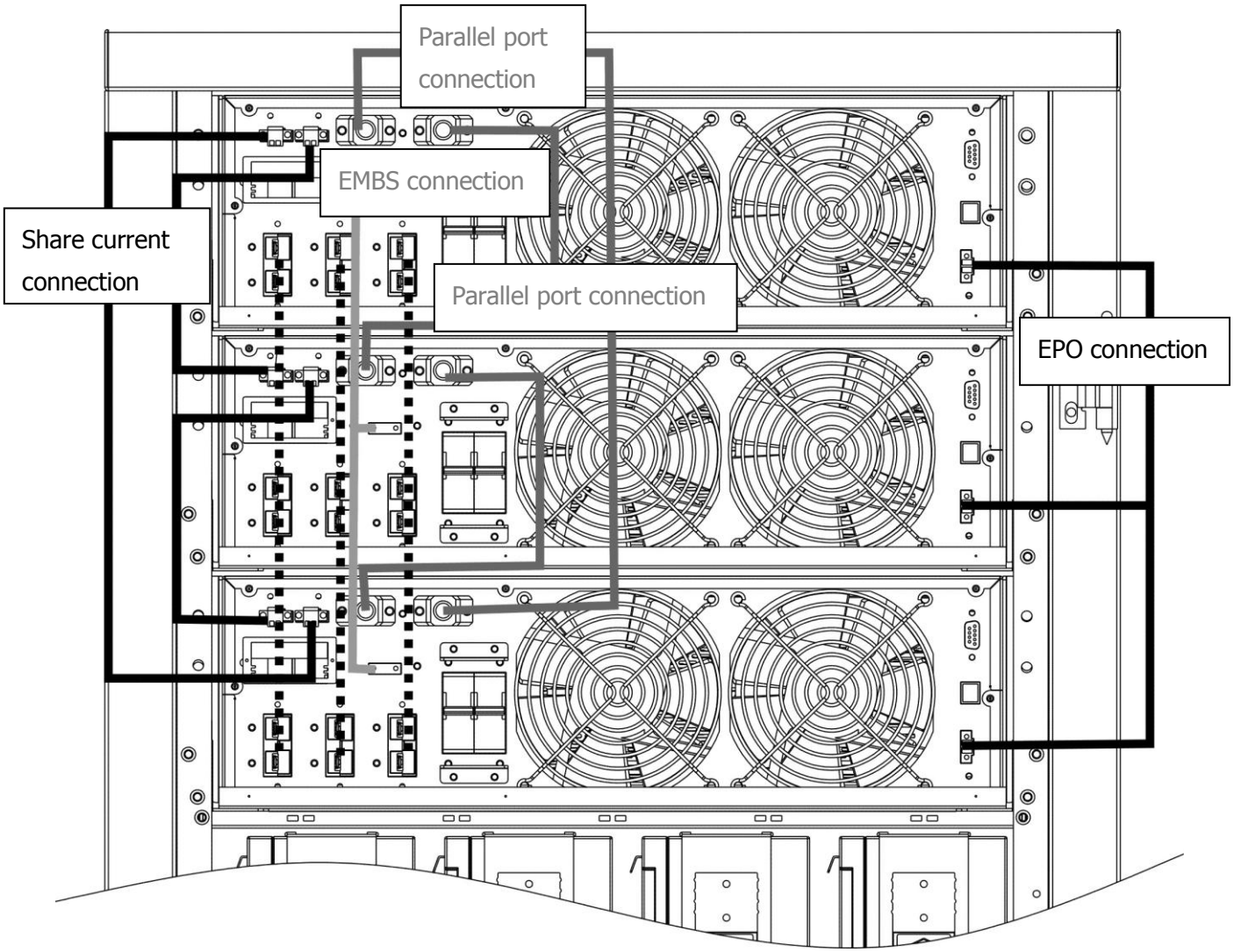


Figure 7: UPS connections

CAUTION: Share current cable is applied with red/black wire. EMBS cable is applied with black/black wire. EPO cable is applied with red/red wire.

6) After installation, please recheck if all cables/wires are connected correctly.
7) Before connecting loads to the UPS, be sure that UPS system and all loads are in "off" status.
8) No matter if the utility exists on UPS input or not, it may still contain electricity on UPS output even though shutting down the UPS system. Therefore, please be sure to turn off the UPS system and then cut off utility input. Then, there is no output from the UPS system.
9) After connecting all cables/wires and turning on the UPS system, this UPS will automatically charge battery. Please charge the battery at least 8 hours before initial use. If not, it still can work normally, but the backup time may be shorter than expected time.
10) When connecting inductive loads, it's requested to have big starting power. The starting power is 4 to 6 times of rated power. Please evaluate the UPS capacity based on starting power.

3. Operations

3-1. Parallel System Operation

Turn On the System

1) After all connections are properly installed, please turn "ON" UPS master switch and switch input breaker of all UPSs to "ON" status. Then, turn "ON" input switch of each UPS unit. The cooling fan will start to operate at the same time. All LEDs on front panels will light up. After initialization, only bypass LED will light up. Then, all UPSs will operate under bypass mode.
2) Please turn on each UPS one by one in one minute (press "ON" button for 1 second to turn on UPS). A few seconds later, all UPSs will enter to AC mode and LINE indicator on each UPS will light up. It will display "PAR 001~003" in order. The parallel system connection is complete. Then, turn on the output breaker of all UPSs.

   CAUTION: Before operation, please measure the voltage difference between the output line of each UPS with multimeter. Be sure that the output voltage difference should be less than 1V. If the difference is larger than 1V, please adjust inverter voltage via LCD operation. Please refer to single UPS manual for detailed LCD operation.

Turn Off the System

1) Turn off each UPS one by one in one minute (press "OFF" button for 1 second to turn off UPS). A few seconds later, all UPSs will transfer to bypass mode.

   CAUTION: If only removing one UPS, please press "OFF" button twice on the removing UPS and each time should last for more than 0.5s. Then, this UPS will enter into bypass mode without output. The other two UPSs will parallel operate normally.

2) Until now, there is bypass output from the UPS system. If shutting down output of this system completely, please turn off input breakers on back panel of each UPS, input master switch, and input breakers for all UPSs on the distribution panel. Then, this UPS will save all data and LCD panel will be still on at the same time. After a few seconds, the LCD display will shut off. This UPS system is completely off now.

   CAUTION: Be sure to wait until the UPS system is completely turned on and operated, then, turn on the power of connected load. Therefore, before shutting down UPS system, please turn off all power of connected loads first.

3-2. Replacement

UPS Replacement

Once any UPS is damaged, replacement can be completed in 10 minutes. Follow below steps to replace damaged UPS.

Step 1: Turn off input/output breakers of damaged UPS on distribution panel.

Step 2: Remove parallel cable, input/output cables, current share cable, EMBS cable, EPO cable, and battery cable from damaged UPS.

Step 3: Remove damaged UPS from the chassis.

Step 4: Replace with new UPS and connect all cables correctly. Turn "ON" the input breaker on new UPS unit and switch input and output breakers of new UPS on distribution panel to "ON" status.

Step 5: After pressing "ON" button for 1 second, the new UPS will start to operate with parallel system.

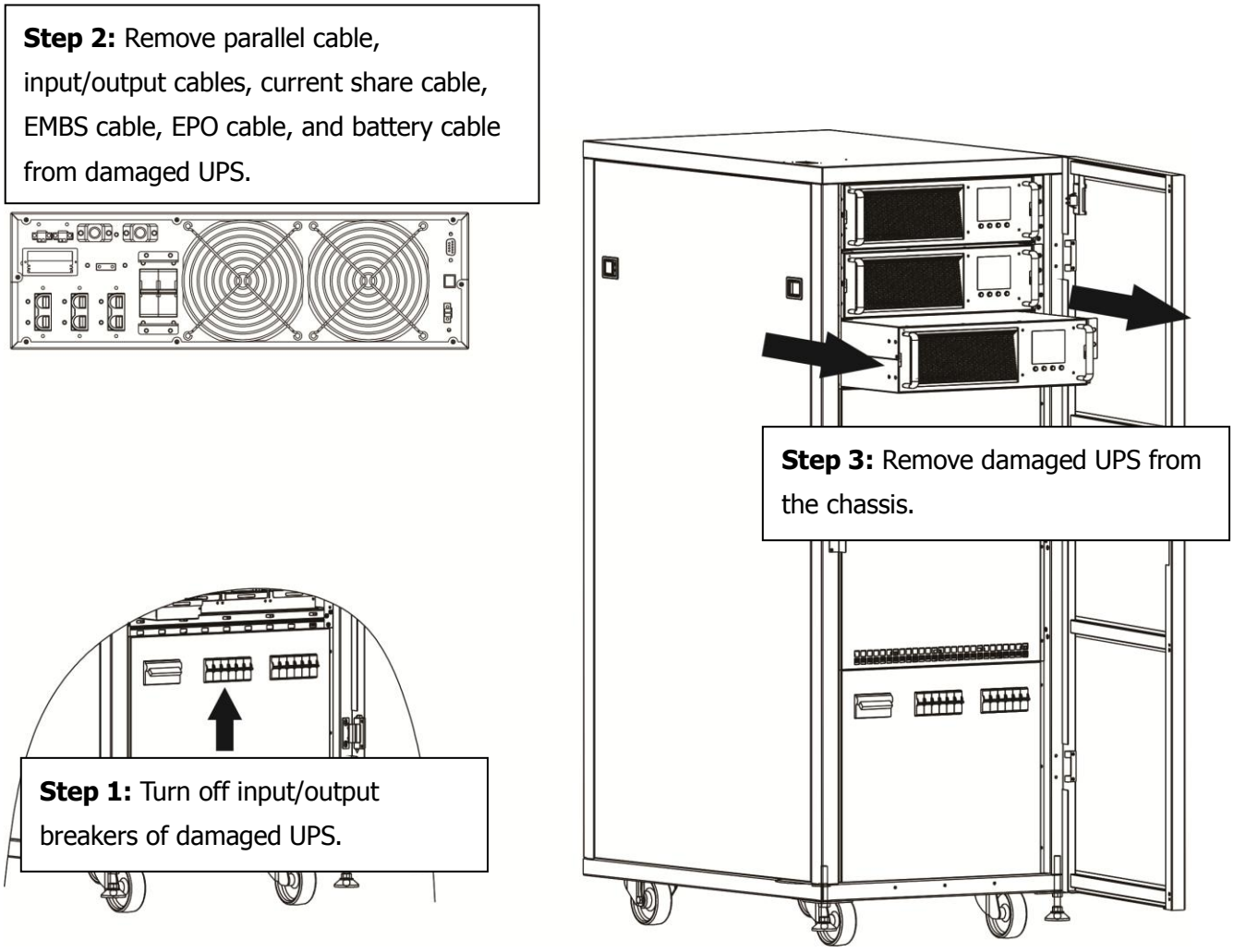

Step 2: Remove parallel cable, input/output cables, current share cable, EMBS cable, EPO cable, and battery cable from damaged UPS.
Step 3: Remove damaged UPS from the chassis.
Step 1: Turn off input/output breakers of damaged UPS.

Figure 8: Damaged UPS replacement

Battery Replacement

It's easy to replace bad batteries in 15 minutes even it's still under operation. Follow below steps to replace bad batteries.

Step 1: Unscrew 2 screws holding the battery retention plate and remove the plate.

Step 2: Remove all connected battery cables. (Paste insulated tapes in the end of battery cable to avoid short circuit)

Step 3: Pull out the battery drawer and replace bad batteries.

Step 4: Re-connect battery cables and re-assemble battery retention plate in reverse order.

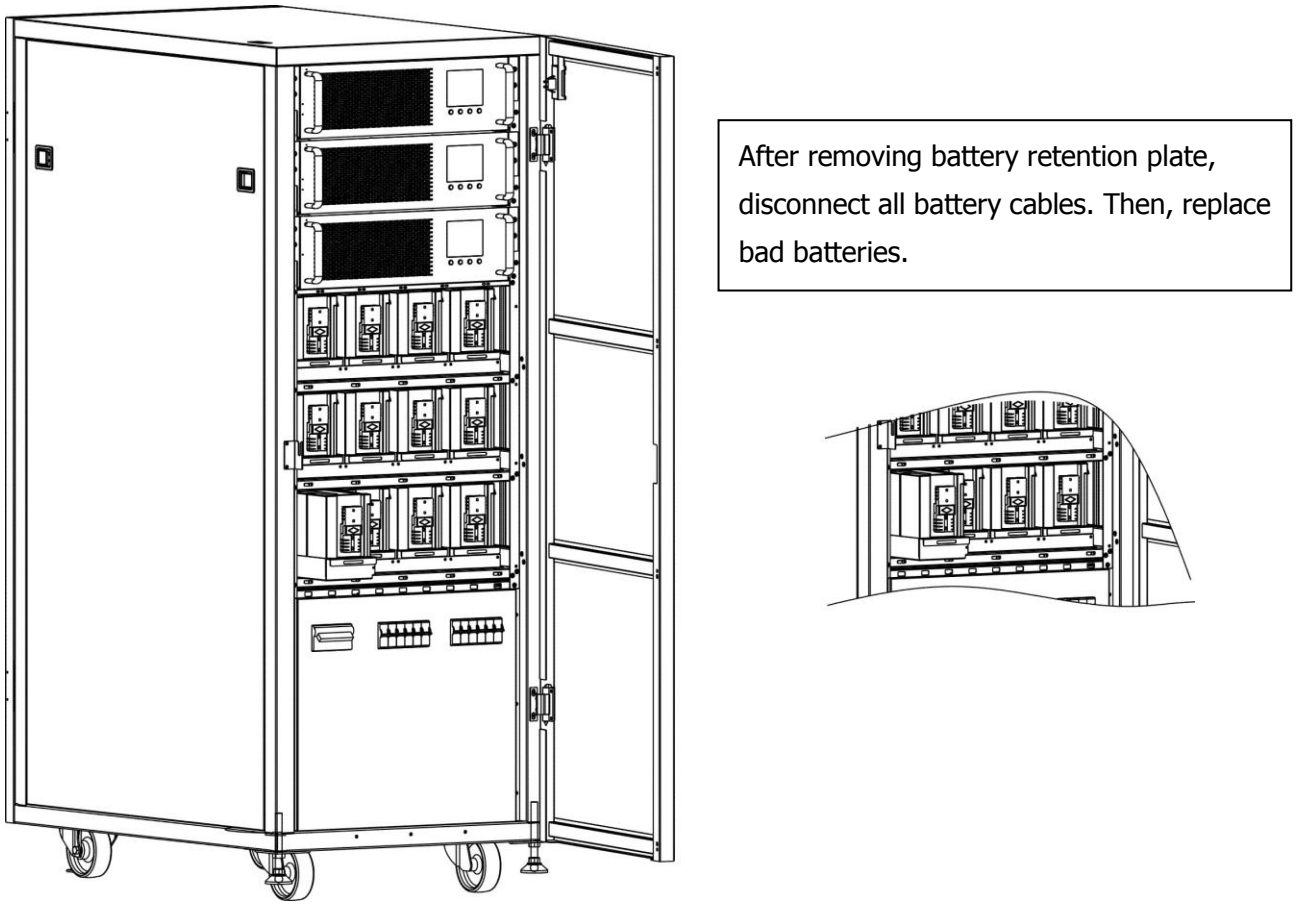


Figure 9: Battery replacement

3-3. Dual Mains Input (Optional) & Maintenance Bypass Switch Operation

Dual mains input (Optional)

This feature will allow this UPS system to accept dual mains inputs. It will switch the other power source when one input power fails. This second power source can be either power supply system or generator. This feature will provide higher reliability for power protection.

Maintenance Bypass Switch

When fault occurs on two or more UPSs, it's necessary to repair this UPS system. Please remove the maintenance bypass cover and set the maintenance switches from "UPS" to "BPS". This feature will allow UPS to operate in bypass mode so that all connected loads can still run without interruption.

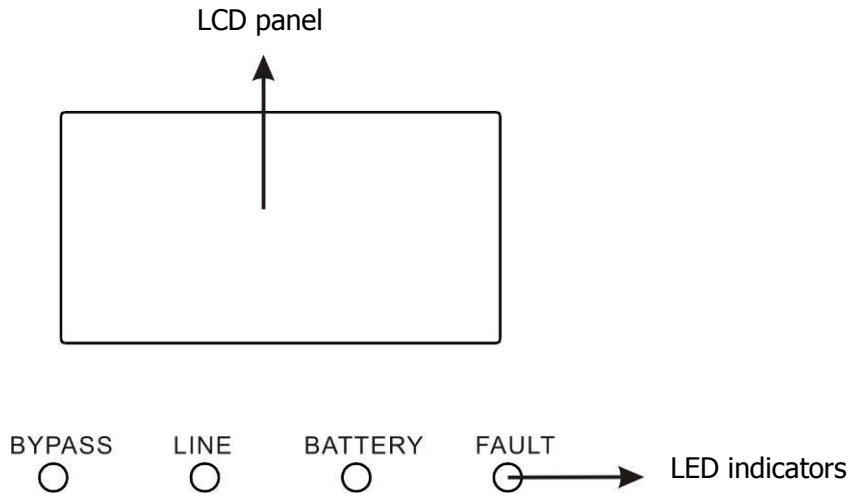
4. Single UPS Button and LCD Operation

4-1. Button Operation

Button	Function
ON/Enter Button	➢ Turn on the UPS: Press and hold the button more than 0.5s to turn on the UPS. ➢ Enter Key: Press this button to confirm the selection in setting menu.
OFF/ESC Button	➢ Turn off the UPS: Press and hold the button more than 0.5s to turn off the UPS. ➢ Esc key: Press this button to return to last menu in setting menu.
Test/Up Button	➢ Battery test: Press and hold the button more than 0.5s to test the battery while in AC mode, or CVCF mode. ➢ UP key: Press this button to display next selection in setting menu.
Mute/Down Button	➢ Mute the alarm: Press and hold the button more than 0.5s to mute the buzzer. Please refer to section 3-4-9 for details. ➢ Down key: Press this button to display previous selection in setting menu.
Test/Up + Mute/Down Button	➢ Press and hold the two buttons simultaneous more than 1s to enter/escape the setting menu.

* CVCF mode means converter mode.

4-2. LED Indicators and LCD Panel



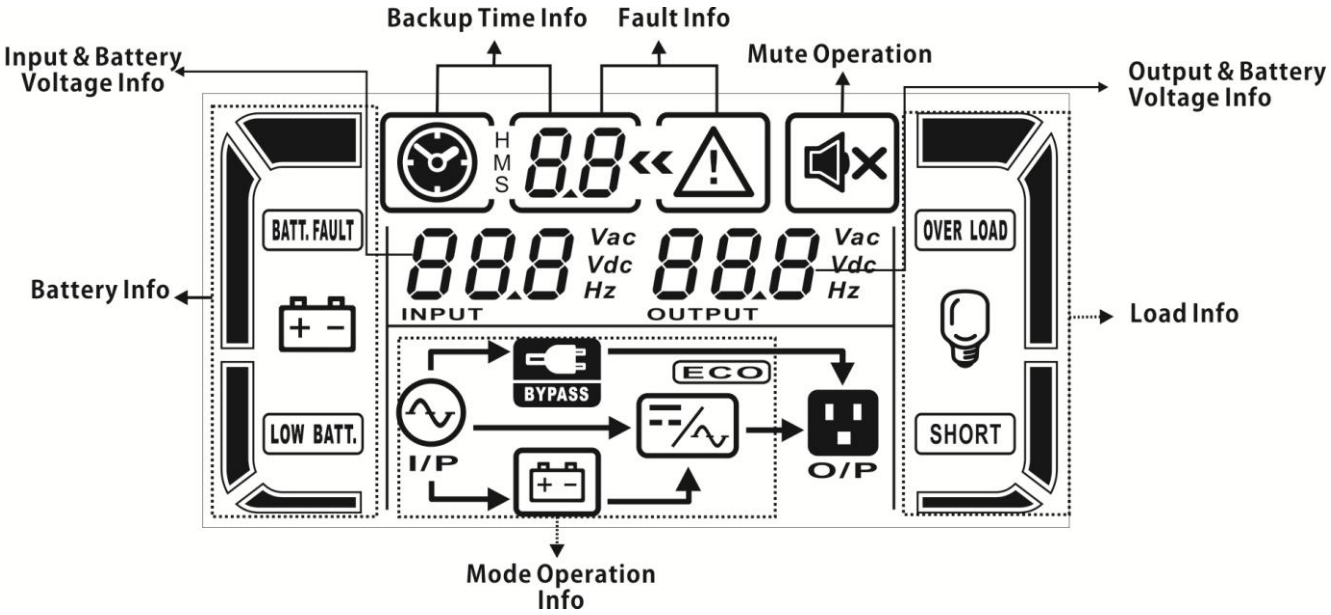
LED Indicators:

There are 4 LEDs on front panel to show the UPS working status:

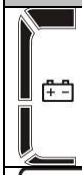
Mode / LED	Bypass	Line	Battery	Fault
UPS Startup	●	●	●	●
Bypass mode	●	○	○	○
AC mode	○	●	○	○
Battery mode	○	○	●	○
CVCF mode	○	●	○	○
Battery Test	●	●	●	○
ECO mode	●	●	○	○
Fault	○	○	○	●

Note: ● means LED is lighting, and ○ means LED is faded.

LCD Panel:



Display	Function
Backup time information	
H M S	Indicates battery discharge time in numbers. H: hours, M: minutes, S: seconds
Fault information	
	Indicates that the warning and fault occurs.
	Indicates the fault codes, and the codes are listed in details in section 3-9.
Mute operation	
	Indicates that the UPS alarm is disabled.
Output & Battery voltage information	
Vac Vdc Hz OUTPUT	Indicates the output voltage, frequency or battery voltage. Vac: output voltage, Vdc: battery voltage, Hz: frequency
Load information	
	Indicates the load level by 0-25%, 26-50%, 51-75%, and 76-100%.
OVER LOAD	Indicates overload.
SHORT	Indicates the load or the output is short.
Mode operation information	
I/P	Indicates the UPS connects to the mains.
	Indicates the battery is working.
BYPASS	Indicates the bypass circuit is working.
ECO	Indicates the ECO mode is enabled.
	Indicates the Inverter circuit is working.
O/P	Indicates the output is working.

Battery information	
	Indicates the Battery capacity by 0-25%, 26-50%, 51-75%, and 76-100%.
BATT. FAULT	Indicates the battery is not connected.
LOW BATT.	Indicates low battery level and low battery voltage.
Input & Battery voltage information	
	Indicates the input voltage or frequency or battery voltage. Vac: Input voltage, Vdc: battery voltage, Hz: input frequency

4-3. Audible Alarm

Description	Buzzer status	Muted
UPS status		
Bypass mode	Beeping once every 2 minutes	Yes
Battery mode	Beeping once every 4 seconds	
Fault mode	Beeping continuously	
Warning		
Overload	Beeping twice every second	No
Low battery	Beeping once every second	
Battery is not connected		
Over charge		
Fan failure/Over temperature		
Charger failure		
IP fuse broken		
Overload 3 times in 30min		
EPO status		
Cover of maintain switch is open		
Parallel protection		
Fault		
Bus start failure	Beeping continuously	Yes
Bus over		
Bus under		
Bus unbalance		
Inverter soft start failure		
High Inverter voltage		
Low Inverter voltage		
Inverter output short circuited		
Negative power fault		
Battery SCR short circuited		
Inverter relay short circuited		
Parallel communication failure		
Parallel output current unbalance		
Over temperature		
CPU communication failure		
Overload		

4-4. Fault Code

Fault event	Fault code	Icon	Fault event	Fault code	Icon
Bus start failure	01	None	Negative power fault	1A	None
Bus over	02	None	Battery SCR short circuited	21	None
Bus under	03	None	Inverter relay short circuited	24	None
Bus unbalance	04	None	Parallel communication failure	35	None
Inverter soft start failure	11	None	Parallel output current unbalance	36	None
High Inverter voltage	12	None	Over temperature	41	None
Low Inverter voltage	13	None	CPU communication failure	42	None
Inverter output short circuited	14	SHORT	Overload	43	OVER LOAD

4-5. Warning Indicator

Warning	Icon (flashing)	Alarm
Battery low	⚠ LOW BATT.	Beeping every second
Overload	⚠ OVER LOAD	Beeping twice every second
Battery is not connected	⚠ BATT. FAULT	Beeping every second
Over charge	⚠	Beeping every second
EPO enable	⚠ EP	Beeping every second
Fan failure/Over temperature	⚠	Beeping every second
Charger failure	⚠	Beeping every second
I/P fuse broken	⚠	Beeping every second
Overload 3 times in 30min	⚠	Beeping every second
Parallel Protection	⚠ 3F	Beeping every second

5. Trouble Shooting

If the UPS system does not operate correctly, please solve the problem by using the table below.

Symptom	Possible cause	Remedy
No indication and alarm in the front display panel even though the mains is normal.	The AC input power is not connected well.	Check if input cable firmly connected to the mains.
The icon ⚠ and the warning code EP flash on LCD display and alarm beeps every second.	EPO function is enabled.	Set the circuit in closed position to disable EPO function.
The icon ⚠ and BATT. FAULT flash on LCD display and alarm beeps every second.	The external or internal battery is incorrectly connected.	Check if all batteries are connected well.
The icon ⚠ and OVER LOAD flash on LCD display and alarm beeps twice every second.	UPS is overload.	Remove excess loads from UPS output.
	UPS is overloaded. Devices connected to the UPS are fed directly by the electrical network via the Bypass.	Remove excess loads from UPS output.
	After repetitive overloads, the UPS is locked in the Bypass mode. Connected devices are fed directly by the mains.	Remove excess loads from UPS output first. Then shut down the UPS and restart it.
Fault code is shown as 43. The icon OVER LOAD lights on LCD display and alarm beeps continuously.	UPS is overload too long and becomes fault. Then UPS shut down automatically.	Remove excess loads from UPS output and restart it.
Fault code is shown as 14, the icon SHORT lights on LCD display, and alarm beeps continuously.	The UPS shut down automatically because short circuit occurs on the UPS output.	Check output wiring and if connected devices are in short circuit status.
Fault code is shown as 1, 2, 3, 4, 11, 12, 13, 14,1A, 21, 24, 35, 36, 41, 42or 43 on LCD display and alarm beeps continuously.	A UPS internal fault has occurred. There are two possible results: 1. The load is still supplied, but directly from AC power via bypass. 2. The load is no longer supplied by power.	Contact your dealer.
Battery backup time is shorter than nominal value	Batteries are not fully charged	Charge the batteries for at least 7 hours and then check capacity. If the problem still persists, consult your dealer.
	Batteries defect	Contact your dealer to replace the battery.
The icon ⚠ and flash on LCD display and alarm beeps every second.	Fan is locked or not working; or the UPS temperature is too high.	Check fans and notify dealer.

Symptom	Possible cause	Remedy
The icon ⚠ and warning code 3F flash on LCD display and alarm beeps every second.	Loose parallel communication cable or incorrect parallel operation.	For parallel system, make sure parallel communication cable is connected tightly and also check if the PRA ID number is right after turning on input breakers one by one. If all the number displays are correct, it's ok to turn on UPSs after disabling the warning message by pressing 'UP' and 'DOWN' button together. Otherwise, please do NOT turn on UPSs and contact your dealer for help. For single UPS, since there is no communication cable and parallel output cable connection, simply ignore this warning message by pressing 'UP' and 'DOWN' button and turning on UPS for continuous operation.

6. Battery Maintenance

6-1. Battery Maintenance & Storage

- This UPS is applied with maintenance-free sealed lead acid batteries. When this UPS is connected to the utility, it will automatically charge battery no matter this UPS is on or not. It also offers overcharge and over-discharge protection.
- Before storing this UPS for long-time period, charge the UPS every 4-6 months. Under environment with high temperature, please charge and discharge the UPS every 2 months. The charging duration should last at least 12 hours each time.
- It's usually 3-year lifecycle for battery when working in the temperature of 25°C. If battery is detected abnormal, be sure to replace it ASAP. Battery replacement should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.
- When replacing the batteries, use the same number and type of batteries.
- Please replace all batteries in the same time and follow instructions from battery supplier. It's not recommended to replace single battery in a time.
- If UPS system seldom discharges battery, please discharge battery until UPS shuts down every 4-6 months and recharge battery at least 12 hours. Be sure to discharge battery with at least 50% loads connected.

6-2. Important Safety Caution

Before servicing battery, please read following instructions first.

Before servicing battery, please remove watches, rings, or other metal objects.

When replacing battery wires, please buy materials from original dealer to avoid a fire caused by heating wires.

Do not attempt to dispose of batteries by burning them. This could cause battery explosion. The batteries must be rightly deposed according to local regulation.

Do not open or destroy batteries. Escaping electrolyte can cause injury to the skin and eyes. It may be toxic.

Please avoid short circuit in the plus and minus pole of the battery. Otherwise, it will cause a fire or electric shock.

Verify that no voltage between the battery terminals and the ground is present before maintenance or repair. In this product, the battery circuit is not isolated from the input voltage. Hazardous voltages may occur between the battery terminals and the ground.

Even after the unit is disconnected from the mains, components inside the UPS system are still connected to the battery packs which are potentially dangerous. The battery supply should be therefore disconnected in the plus and minus pole at the quick connectors of the battery when maintenance or service work inside the UPS is necessary.

The UPS system operates with hazardous voltages. Repairs may be carried out only by qualified maintenance personnel.

6. Specifications

MODEL		**Ensure 18K**	**Ensure 30K**	**Ensure 3/1 30K**
TOTAL CAPACITY		18KVA	30KVA	30KVA
UPS UNITS		3 x 6KVA	3 x 10KVA	3 x 3P/1P 30KVA
TOPOLOGY		True Double-Conversion Online with 2+1 Parallel Redundancy Design		
INPUT				
Input Voltage		380/220 VAC 3 Φ4w or 220 VAC 3 Φ3w or 208/120 VAC 3 Φ4w or 120 VAC 3 Φ3w or 220 VAC 1Φ2w or 120 VAC 1Φ2w		380/220 VAC 3 Φ4w or 220 VAC 1Φ2w
Frequency Range		46 Hz ~ 54 Hz or 56 Hz ~ 64 Hz		
Power Factor		≧ 0.99 at 100% Load		
OUTPUT				
Output voltage		1Φ2w×2 groups with output transformer, 104/208 VAC or 110/220 VAC or 115/230 VAC or 120/240 VAC		
AC Voltage Regulation		± 1%		
Frequency Range (Synchronized Range)		46 Hz ~ 54 Hz or 56 Hz ~ 64 Hz		
Frequency Range (Batt. Mode)		50 Hz ± 0.1 Hz or 60Hz ± 0.1 Hz		
Overload	AC mode	100%~105%: 10min 105%~115%: 1min >115% : 1sec		
	Battery mode	100%~105%: 30sec 105%~115%: 10sec >115% : 1sec		
Current Crest Ratio		3:1 max		
Harmonic Distortion		≦ 3 % @ 100% Linear Load; ≦10 % @ 100% Non-linear Load		
Transfer Time	Line ⟷ Battery	0 ms		
	Inverter ⟷ Bypass	0 ms		
	Inverter ⟷ ECO	<10 ms		
EFFICIENCY				
Single UPS	AC mode	> 82%		
	Battery Mode	> 81%		
BATTERY				
Type & Numbers		12 V / 7 Ah x 20 (Expandable to 40pcs) / Per UPS Module	12 V / 9 Ah x 20 (Expandable to 40pcs) / Per UPS Module	
Recharge Time		3-4 hours recover to 90% capacity		
Charging Current		2 A ± 10% (max.)		
Charging Voltage		273VDC ± 1%		
PHYSICAL				
Single UPS	Dimension, DXWXH(mm)	580 x 438 x 133 [3U]	668 x 438 x 133 [3U]	668 x 438 x 133 [3U]
	Net Weight (kgs)	17	20	22
Whole System	Dimension, DXWXH(mm)	860 x 560 x 1450		
	Net Weight (kgs)	500	610	460
ENVIRONMENT				
Operation Temperature		0 ~ 40°C (the battery life will down when > 25°C)		
Operation Humidity		<95 % and non-condensing		
Operation Altitude**		<1000m		
Acoustic Noise Level		Less than 58dB @ 1 Meter (For UPS Module)		
MANAGEMENT				
Smart RS-232 or USB		Supports Windows® 2000/2003/XP/Vista/2008/7/8, Linux, Unix, and MAC		
Optional SNMP		Power management from SNMP manager and web browser		

*Product specifications are subject to change without further notice.